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(54) **Double current collector negative electrode design for alkali metal ion electrochemical cells**

(57) A new sandwich negative electrode design for a secondary cell is provided comprising a "sacrificial" alkali metal along with a carbonaceous anode material. In the case of a hard carbon anode material, the sacrificial alkali metal is preferably lithium and is sized to compensate for the initial irreversible capacity of this anode material. Upon activating the cells, the lithium metal automatically intercalates into the hard carbon anode

material. That way, the sacrificial lithium is consumed and compensates for the generally unacceptable irreversible capacity of hard carbon. The superior cycling longevity of hard carbon now provides a secondary cell of extended use beyond that known for conventional secondary cells having only graphitic anode materials.

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# PARTIAL EUROPEAN SEARCH REPORT

Application Number

which under Rule 45 of the European Patent Convention EP 01 12 7533  
shall be considered, for the purposes of subsequent  
proceedings, as the European search report

DOCUMENTS CONSIDERED TO BE RELEVANT			
Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (Int.Cl.7)
A	PATENT ABSTRACTS OF JAPAN vol. 1999, no. 14, 22 December 1999 (1999-12-22) -& JP 11 246209 A (OSAKA GAS CO LTD), 14 September 1999 (1999-09-14) * abstract *	1,15,19	H01M4/02 H01M4/06 H01M4/36 H01M6/16
A	PATENT ABSTRACTS OF JAPAN vol. 2000, no. 12, 3 January 2001 (2001-01-03) -& JP 2000 260475 A (SANYO ELECTRIC CO LTD), 22 September 2000 (2000-09-22) * abstract *	1,15,19	
D,A	US 5 443 928 A (TAKEUCHI ET AL) 22 August 1995 (1995-08-22)	1,15,19	
A	US 4 310 609 A (LIANG ET AL) 12 January 1982 (1982-01-12)		
A	US 5 472 810 A (TAKEUCHI ET AL) 5 December 1995 (1995-12-05)		TECHNICAL FIELDS SEARCHED (Int.Cl.7)
A	US 5 516 340 A (TAKEUCHI ET AL) 14 May 1996 (1996-05-14)		H01M
INCOMPLETE SEARCH			
<p>The Search Division considers that the present application, or one or more of its claims, does/do not comply with the EPC to such an extent that a meaningful search into the state of the art cannot be carried out, or can only be carried out partially, for these claims.</p> <p>Claims searched completely :</p> <p>Claims searched incompletely :</p> <p>Claims not searched :</p> <p>Reason for the limitation of the search:</p> <p>see sheet C</p>			
Place of search		Date of completion of the search	Examiner
The Hague		4 July 2005	Gregg, N
CATEGORY OF CITED DOCUMENTS		<p>T : theory or principle underlying the invention</p> <p>E : earlier patent document, but published on, or after the filing date</p> <p>D : document cited in the application</p> <p>L : document cited for other reasons</p> <p>&amp; : member of the same patent family, corresponding document</p>	
<p>X : particularly relevant if taken alone</p> <p>Y : particularly relevant if combined with another document of the same category</p> <p>A : technological background</p> <p>O : non-written disclosure</p> <p>P : intermediate document</p>			

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EPO FORM 1503 03/82 (P04C07)



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**INCOMPLETE SEARCH  
SHEET C**

Application Number  
EP 01 12 7533

Claim(s) searched incompletely:  
1-20

Reason for the limitation of the search:

Present claims 1, 15 and 19 relate to an extremely large number of possible compounds for short circuited andoe active material. Support within the meaning of Article 84 EPC and/or disclosure within the meaning of Article 83 EPC is to be found, however, for only a very small proportion of the compounds claimed. In the present case, the claims so lack support, and the application so lacks disclosure, that a meaningful search over the whole of the claimed scope is impossible. Consequently, the search has been carried out for those parts of the claims which appear to be supported and disclosed, namely those citing actual cathodic materials or structures (such as in claims 2 or 3).

**ANNEX TO THE EUROPEAN SEARCH REPORT  
ON EUROPEAN PATENT APPLICATION NO.**

EP 01 12 7533

This annex lists the patent family members relating to the patent documents cited in the above-mentioned European search report.  
The members are as contained in the European Patent Office EDP file on  
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04-07-2005

Patent document cited in search report		Publication date	Patent family member(s)	Publication date
JP 11246209	A	14-09-1999	NONE	
JP 2000260475	A	22-09-2000	NONE	
US 5443928	A	22-08-1995	NONE	
US 4310609	A	12-01-1982	AU 541718 B2	17-01-1985
			AU 6119580 A	25-06-1981
			CA 1147385 A1	31-05-1983
			DE 3031554 A1	25-06-1981
			FR 2471673 A1	19-06-1981
			GB 2065957 A ,B	01-07-1981
			IL 60748 A	30-03-1984
			JP 1028464 B	02-06-1989
			JP 1545264 C	15-02-1990
			JP 56093266 A	28-07-1981
			MX 157494 A	28-11-1988
			NL 8006638 A ,B,	16-07-1981
			SE 451920 B	02-11-1987
			SE 8005496 A	18-06-1981
			US 4391729 A	05-07-1983
US 5472810	A	05-12-1995	US 5516340 A	14-05-1996
			AT 162909 T	15-02-1998
			AU 669425 B2	06-06-1996
			AU 5786594 A	22-09-1994
			DE 69408188 D1	05-03-1998
			DE 69408188 T2	14-05-1998
			EP 0618630 A1	05-10-1994
			JP 3445654 B2	08-09-2003
			JP 6342656 A	13-12-1994
US 5516340	A	14-05-1996	US 5472810 A	05-12-1995
			AT 162909 T	15-02-1998
			AU 669425 B2	06-06-1996
			AU 5786594 A	22-09-1994
			DE 69408188 D1	05-03-1998
			DE 69408188 T2	14-05-1998
			EP 0618630 A1	05-10-1994
			JP 3445654 B2	08-09-2003
			JP 6342656 A	13-12-1994